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AMENDMENTS TO THE SPECIFICATION

Please delete the paragraph beginning on page 1, line 7, and ending on page 1, line 15, and replace with the following paragraph:

This application claims priority from Stanley STEIN *et al.*, "Highly Sensitive and Specific IgM-Capture...," provisional patent filing serial no. 60/242,819 filed 24 Oct. 2000 and Bo QIU ~~QUI~~ *et al.*, which is incorporated by reference in its entirety herein. ~~"Multiple Epitopes Connected By A Carrier," Serial No. 09/_____, filed ___ Oct. 2001. The contents of these, together with Bo QUI, "Studies of Polymers" (unpublished) and~~ The article by Bo QIU *et al.*, "Selection of Continuous Epitope Sequences," 55 Biopolymers 319 (2001) is also ~~are~~ incorporated here by reference.

Please delete the paragraph beginning on page 2, line 3, and ending on page 2, line 17, and replace with the following paragraph:

Thus, our basic idea can be used to make, for example, an immunological test kit. The term "immunological test kit" means a test kit which uses immune (*e.g.*, antibody-epitope or antibody-antigen) interaction to test for the presence or absence of an analyte ~~anlayte~~. Currently-known examples include ELISA, capillary immuno-chromatography and column immuno-chromatography. In making an immunological test kit, it may be desirable to conjugate reporter moiety on the immunologically invisible carrier (*e.g.*, polyethylene glycol). As another example, our basic idea can be used to conjugate several immunologically reactive substances (either several copies of the same substance, or copies of each of several different substances) together using an immunologically invisible carrier, which conjugate can be then used in an immunological test kit.

Please delete the paragraph beginning on page 2, line 17, and ending of page 2, line 30, and replace with the following paragraph:

The immunologically reactive substance(s) can be one or more of the *Borellia burgdorferi* epitope polypeptides we discovered: VQEGVQQEGAQQP-(beta-A)(beta-A[[,4]])C [SEQ ID NO: 1]; EIAAKAIGKKIHQNNG-(beta-A)(beta-A)C [SEQ ID NO: 2]; ISTLIKQKLDGLKNE-(beta-A)(beta-A)C [SEQ ID NO: 3]; PVVAESPKKPE ~~PWAESPKKPE~~-(beta-A) (beta-A)C [SEQ ID NO: 4]; DKKAINLDKAQQKLD-(beta-A)(beta-A)C [SEQ ID NO: 5]; ITKGKSQKSLGD-(beta-A)(beta-A)C [SEQ ID NO: 6]; and GMTFRAQEGAFLTG-(beta-A) (beta-A)C [SEQ ID NO: 7]. Alternatively, one could use as antigen the nucleic acid coding for one or more of these epitopes. Using such an epitope enables one to make an apparatus for isolating anti-*Borellia burgdorferi* antibody (*i.e.*, a Lyme disease test kit), a vaccine, or a therapeutic. Similarly, the nucleic acid sequences coding for these polypeptides may be useful as antigen, or to make large quantity of polypeptide.

Please insert the following text between lines 27 and 28 of page 3:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the synthesis of a polyethylene glycol-derived copolymer, which has multiple amino groups capable of attaching peptides to the copolymer.

Figure 2 shows the synthesis of polyethylene glycol (PEG) and peptide conjugates, which contain multiple copies of peptides and reporter molecules.

Figure 3 is a schematic representation of a PEG-peptide conjugate with a reporter group attached to the N-terminus of the peptide.

Figure 4 is a cartoon representation of IgM-capture ELISA using PEG-peptide conjugate as antigen for serological diagnosis of Lyme disease.

Please delete the paragraph beginning on page 3, line 29, and ending on page 3, line 34, and replace with the following paragraph:

Antibodies generally cannot bind to the whole antigen molecule. Rather, a specific antibody binds specifically to one individual epitope on that antigen. The term "immunologically reactive substance" means an epitope, an ~~and~~ antigen or an antibody. To increase the specificity of our assay, we prefer to use not entire antigens, but one or more defined epitopes.

Please delete the paragraph beginning on page 4, line 17, and ending on page 4, line 20, and replace with the following paragraph:

Whole antigen or antibody may be used instead of epitope, to mount to the carrier molecule. If mounting antibody on the carrier, the antibody-carrier complex can be used to trap antigen or epitope analyte in the test ~~teat~~ solution.

Please delete the paragraph beginning on page 6, line 4, and ending on page 6, line 27, and replace with the following paragraph:

Such polymers are known in the art. General reviews of such compounds include Langer, R., "Biomaterials in Drug Delivery," 33 ACC. CHEM. RES. 94 (2000); and Langer, R., "Tissue Engineering," 1 MOL. THER. 12 (2000). One example of such an immunologically invisible compound is a N-vinylpyrrolidone-methyl methacrylate co-polymer, perhaps with added polyamide-6. Buron, F. *et al.*, *Biocompatable Osteoconductive Polymer*, 16 CLIN. MATER. 217 (1994). Another example is poly (DL-lactide-co-glycolide) capsules. Isobe, M. *et al.*, *Bone Morphogenic Protein Encapsulated with a Biodegradable and Biocompatible Polymer*, 32 J. BIOMED. MATER. RES. 433 (1996). Another example is a 70:30 ratio mixture of methylmethacrylate:2-hydroxyethyl methacrylate. Bar, F.W. *et al.*, *New Biocompatable Polymer Surface Coating*, 52 J. BIOMED. MATER. RES. 193 (2000). Another example, is 2-methacryloyloxyethyl phosphorylcholine, perhaps with polyurethane. Iwasaki, Y. *et al.*, *Semi-Interpenetrating Polymer Networks. . .*, 52 J. BIOMED. MATER. RES. 701 (2000). Polyvinyl pyrrolidone may also be used, as may polyethylene glycol and its derivatives. Other biocompatible polymers ~~polymcnrs~~ are known in the art. *E.g.*, Haisch, A. *et al.*, *Tissue Engineering of Human Cartlage Tissue*, 44 HNO 624 (1996); Ershov, I.A. *et al.*, *Polymer Biocompatible X-Ray Contract Hydrogel*, 2 MED. TEKH. 37 (1994); Polous, I.M. *et al.*, *Use Of A Biocompatible Antimicrobial Polymer Film*, 134 VESTN. KHIR. IM. II GREK. 55 (1985).

Please delete the paragraph beginning on page 8, line 14, and ending on page 8, line 28, and replace with the following paragraph:

The conjugation of epitope peptides may use thiol-specific chemistry under mild conditions. The easiest strategy for peptide conjugation is to add an extra amino acid on either the amino ~~ammo~~ or carboxyl terminus of the peptide to allow one-site coupling to the carrier. In our study design, a cysteine residue, followed by two β-alanine residues, was incorporated at the C-terminus of each epitope peptide during solid phase peptide synthesis. Putting two more β-alanine residues between the conjugation anchor, cysteine, and the epitope peptide is used as a precaution to generate further flexibility of the linear peptides, and therefore help them to adopt the optimal conformations for stronger antibody binding. The N-terminus of the peptides needs to be capped in order to remove charges associated with free amino groups and thereby mimicking the real environment in the protein.

Please delete the paragraph beginning on page 10, line 18, and ending on page 10, line 27, and replace with the following paragraph:

Our preferred embodiment of our invention entails four parts: 1) the selection of specific epitopes by epitope mapping; 2) the design and synthesis of a carrier molecule with multiple attachment sites; 3) the preparation of multivalent carrier-peptide conjugates with one or more reporter groups; and 4) the use of the prepared carrier-peptide-reporter conjugates in an immunological assay. Here is how you can use [[of]] our preferred embodiment to make an indirect IgM-capture ELISA effective for the diagnosis of Lyme disease at its earliest state.

Please delete the paragraph beginning on page 13, line 5, and ending on page 13, line 19, and replace with the following paragraph:

The SPOTS membrane must be regenerated after analysis of each serum sample to remove [[I]] bound proteins before storage or regarding-probing. To regenerate the membrane, it was washed with 5x20 mL MilliQ water and then 3x20 mL DMF followed by another 2x20 mL MilliQ water. Then, 20 mL, of regeneration buffer A (485.0 g urea, 10.0 g. SDS and 1 mL 2-mercapteotbanol in 1 L of MilliQ water) was added and the membrane was incubated for 10 minutes at room temperature. The process was repeated twice. Then 20 mL of regeneration buffer B (Mix 400 mL of MilliQ water and 500 mL ethanol, add 100 mL of acetic acid to above solution) was added and the membrane was incubated for 10 minutes at room temperature. The process was repeated twice. Finally, the membrane was washed with 2x20 mL methanol and air-dried. The membrane was stored in a sealed plastic bag in the freezer (-20 °C) until the next analysis.

Please delete the paragraph beginning on page 14, line 7, and ending on page 14, line 15, and replace with the following paragraph:

The coupling procedure was repeated until the desired peptide sequence was obtained. (See Table 1 for the seven synthesized peptides.) When the assembly of the peptide sequence was complete, the N-terminus of all epitope peptides was capped with long chain biotin to serve the two purposes simultaneously. The first purpose is to remove the charge associated with the free amino group of the N-terminus, thus to mimic the real environment in the natural protein sequence. The second purpose is to use the biotin as the detection label for biotin-avidin binding in ELISA.

Please delete the table entitled "Table 1" beginning on page 14, line 16, and ending of page 14, line 19, and replace with the following table:

Table 1
Synthesized Epitopes

Peptide	Sequence	
FLA, AA 211-223	VQEGVQQEGAQQP-(beta-A)(beta-A[[,4]])C [SEQ ID NO: 1]	1639.8
OspC2, AA71-86	EIAAKAIGKKIHQNNG-(beta-A)(beta-A)C [SEQ ID NO: 2]	2274.3
OspC3, AA 104-118	ISTLIKQKLDGLKNE-(beta-A)(beta-A)C [SEQ ID NO: 3]	2282.3
OspC10, AA 198-207	PVVAESPKKPE ~~PWAESPKKPE~~-(beta-A)(beta-A)C [SEQ ID NO: 4]	1762.7
P83-1, AA296-310	DKKAINLDKAQQKLD-(beta-A)(beta-A)C [SEQ ID NO: 5]	2310.3
P83-3, AA431-442	ITKGKSQKSLGD-(beta-A)(beta-A)C [SEQ ID NO: 6]	1843.8
P39, AA129-142	GMTFRAQEGAFLTG-(beta-A)(beta-A)C [SEQ ID NO: 7]	2067.9

Please delete the paragraph beginning on page 20, line 8, and ending on page 20, line 12, and replace with the following paragraph:

The index number of each serum sample was calculated as: Index = Absorbance of individual serum/Cutoff. An index number of 1.0 or above is taken as a [[.]] positive and an index number of 0.8 or below is taken as a negative. Any index number between 0.8 to 1.0 [[1 .0]] is taken as equivocal.